

REMARKS

This paper is responsive to any paper(s) indicated above, and is responsive in any other manner indicated below.

ABSTRACT OBJECTION - TRAVERSE

The abstract has been objected to because of the Office Action concerns listed within the page 2 of the Office Action, i.e., alleging that "protection tape".was an essential element in Applicant's invention, and was not mentioned within the Abstract.

Traversal is appropriate as it is felt that mention of such tape within the abstract would unnecessarily complicate the Abstract. In the event that the Abstract issue becomes the only issue baring allowance of the application, the Examiner is herein authorized to amend to a suitable replacement abstract. With respect to any past, present or any ultimately implemented Abstract or amendment thereof, Applicant would like to reiterate and embrace the 37 CFR 1.72(b) provisions that "The abstract will not be used for interpreting the scope of the claims."

DRAWING OBJECTIONS/SPECIFICATION ADJUSTED

With regard to the section on page 2 of the Office Action, appropriate locations of Applicant's specification have been amended to include mention of the previously-unmentioned reference numeral. As the following is believed to obviate all the listed concerns, reconsideration and withdrawal of the objection to the drawings are respectfully requested.

PENDING CLAIMS

Claims 1-34 were pending, under consideration and subjected to examination in the Office Action. Appropriate claims have been amended and/or deleted in order to adjust a clarity and/or focus of Applicant's claimed invention. That is, such changes are unrelated to any prior art or scope adjustment and are simply refocused claims in which Applicant is present interested. At entry of this paper, Claims 3-10, 13-22 and 25-34 will be pending for further consideration and examination in the application.

REJECTION UNDER '112, 2ND PAR. TRAVERSED "PREDETERMINED" EXPRESSION IS NOT VAGUE OR INDEFINITE

Claims 6, 17 and 29 have been rejected under 35 USC '112, second paragraph, as being indefinite for the concerns listed within the section numbered "?" on page ? of the Office Action, i.e., for including the expression "predetermined". As stated in MPEP 2173.01 entitled "Claim Terminology":

"A fundamental principle contained in 35 U.S.C. 112, second paragraph is that applicants are their own lexicographers. They can define in the claims what they regard as their invention essentially in whatever terms they choose so long as the terms are not used in ways that are contrary to accepted meanings in the art. Applicant may have functional language, alternative expressions, negative limitations, or any style of expression or format of claim which makes clear the boundaries of the subject matter for which protection is sought."

It is respectfully submitted that the present usage of "predetermined" does not render the noted claim(s) vague or indefinite. More particularly, Webster's II New College Dictionary, copyright 1999, p. 870, defines "predetermined" as "to determine, decide, or establish ahead of time." Applicant is not using such expression in a manner contrary to its accepted meaning.

Further, an electronic search of the MPEP found no prohibition against using the expression "predetermined" within claims, and in fact, the search turned up an example MPEP claim which itself actually used "predetermined". That is, http://www.uspto.gov/web/offices/pac/mpep/documents/2100_2106.htm recited the valid claim, "A method of using a computer processor to analyze electrical signals and data representative of human cardiac activity by converting the signals to time segments, applying the time segments in reverse order to a high pass filter means, using the computer processor to determine the amplitude of the high pass filter's output, and using the computer processor to compare the value to a predetermined value."

Based upon the foregoing, reconsideration and withdrawal of the '112 second paragraph rejection of the above-referenced claims are respectfully requested.

REJECTION UNDER 35 USC '103

The 35 USC '103 rejection of claims 1-34 as being unpatentable over Saitoh (U.S. Patent 6,060,373) in view of Grigg et al. (U.S. Patent Publication US 2002/0068453 A1) is respectfully traversed. However, such rejections have been rendered obsolete by the present clarifying amendments to Applicant's claims, and accordingly, traversal arguments are not appropriate at this time. However, Applicant respectfully submits the following to preclude renewal of any such rejections against Applicant's clarified claims.

All descriptions of Applicant's disclosed and claimed invention, and all descriptions and rebuttal arguments regarding the applied prior art, as previously

submitted by Applicant in any form, are repeated and incorporated hereat by reference. Further, all Office Action statements regarding the prior art rejections are respectfully traversed. As additional arguments, Applicant respectfully submits the following.

Unrelated to any prior art rejection, claims 1-2, 11-12 and 23-24 have now been canceled without prejudice or disclaimer, thus rendering this rejection of such claims obsolete at this time. Patentability of remaining ones of the rejected claims are supported as follows.

Applicant's disclosed and claimed invention is directed to arrangements (e.g., apparatus, methods, etc.) aimed at speeding up manufacturing, while at the same time, lessening manufacturing complexity. Discussions will be divided into two differing parts.

More particularly, a first embodiment of Applicant's disclosed and claimed invention uses a combination of a pre-back-grind under-fill layer together with an adhesive protection tape including a flexible conforming layer. That is, Applicant's FIG. 2 shows an adhesive tape 200 which includes a conforming layer 220, which may be combined with Applicant's FIG. 5B pre-back-grind under-fill layer. The conforming layer conforms around any exposed bump portions so as to improve a planarity during back-grinding operations, and also, the conforming tape is advantageous in that it essentially seals the front (primary) side of the die or wafer from being contaminated by residues, chemicals, etc., from the back-grinding operation.

Applicant's independent claim 3 is an example such claim, and such claim recites: A planarizing support layer provided on a bumped surface of one of a

bumped-die and bumped-wafer, the support layer comprising a pre-back-grind under-fill layer both to provide substantially planar back-grind wafer support during any back-grind process, and to provide under-fill material during any mounting/under-fill process, the under-fill layer covering at least a substantial majority of bump-bodies of bumps on the bumped surface, while leaving a remainder portion of the bump-bodies exposed; and an adhesive protection tape including a flexible conforming layer applied to the under-fill layer, the conforming layer to cover the remainder portion of the bump-bodies not covered by the under-fill layer, to further improve a planarity of the support layer.

As neither of the previously-cited Saitoh or Grigg et al. references disclose or suggest Applicant's flexible conforming layer, it is respectfully submitted that such references (either taken alone, or in combination) would not have disclosed or suggested Applicant's claimed invention.

Turning now to the second discussions, a second embodiment of Applicant's disclosed and claimed invention uses an under-fill layer covering an entirety of bump-bodies of bumps on the bumped surface. An example illustration is as shown in Applicant's FIG. 5A. Applicant's realized that any excess under-fill layer rising above the bump structures could later advantageously be squeezed out during mounting so as to underfill areas between opposing lands (of the other substrate). Such embodiment is also advantageous in that it essentially seals the front (primary) side of the die or wafer from being contaminated by residues, chemicals, etc., from the back-grinding operation. Further, it is advantageous in that it eliminates the need for a

further manufacturing step of having to add additional underfill material to totally encase and passivate the bump structures.

Applicant's independent claim 3 is an example such claim, and such claim recites: A planarizing support layer provided on a bumped surface of one of a bumped-die and bumped-wafer, the support layer comprising a pre-back-grind under-fill layer both to provide substantially planar back-grind wafer support during any back-grind process, and to provide under-fill material during any mounting/under-fill process, the under-fill layer covering an entirety of bump-bodies of bumps on the bumped surface.

Turning now to preclude the previously-applied references, it is respectfully noted that such references are incompatible in at least one way. More particularly, Saitoh teaches adhering adhesive tape to flux provided as an encasing protective layer, and after grinding, performing flux washing to remove the flux. In contrast, Grigg et al. teaches use of a "mold compound". Hence, Saitoh appears to apply to a manufacturing step preceding any underfill or "mold compound" step. Thus, combination of Saitoh and Grigg et al. at best have redundant encasing operations with each other, and at worst, if performed together, Saitoh's flux would contaminate Grigg et al.'s "mold compound". Hence, it is respectfully submitted that there would actually be negative incentive to combine the teachings of such references.

As to Grigg et al.'s mold compound, it is respectfully noted that Grigg et al. explicitly teaches that the mold compound layer 30 (Grigg et al.'s FIG. 5) does not fully cover the top area portions of each solder bump 18 (e.g., see paragraphs 0053 and 0061). Unlike Applicant, Grigg et al. failed to recognize that any excess under-fill layer

rising above the bump structures could later advantageously be squeezed out during mounting so as to underfill areas between opposing lands (of the other substrate). Accordingly, Grigg et al. teaches (paragraph 0076) that additional underfill material may be added at a later time to fill in any remaining gaps between the substrates. Such is disadvantageous over Applicant's invention in requiring additional manufacturing steps.

As a result of all of the foregoing, it is respectfully submitted that the applied art (taken alone and in the Office Action combinations) would not support a '103 obviousness-type rejection of Applicant's claims. Accordingly, reconsideration and withdrawal of such '103 rejection, and express written allowance of all of the '103 rejected claims, are respectfully requested. Further, at this point, since claims have only been amended into independent form (i.e., no new limitations have been added), it is respectfully submitted as a reminder that, if new art is now cited against any of Applicant's unamended claims, then it would not be proper to make a next action final.

EXAMINER INVITED TO TELEPHONE

The Examiner is herein invited to telephone the undersigned attorneys at the local Washington, D.C. area telephone number of 703/312-6600 for discussing any Examiner's Amendments or other suggested actions for accelerating prosecution and moving the present application to allowance.

INDICATION OF CHANGES MADE

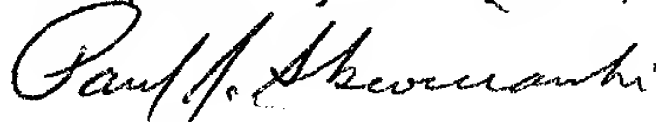
In order to comply with requirements under the recent changes to U.S. practice, amendments are made via the attached "Appendix - Version With Markings To Show Changes Made".

CONCLUSION

In view of the foregoing amendments and remarks, Applicant respectfully submits that the claims listed above as presently being under consideration in the application are now in condition for allowance. Accordingly, early allowance of such claims is respectfully requested.

To the extent necessary, Applicant petitions for an extension of time under 37 CFR '1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees and excess claim fees, to Deposit Account No. 01-2135 (referencing case No. 219.40240X00) and please credit any excess fees to such deposit account.

Respectfully submitted,



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ATTACHMENTS:

Appendix - Version With Markings To Show Changes Made

APPENDIX - VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Please replace the paragraph beginning at page 13, line 14, with the following rewritten paragraph:

Discussion turns next to FIGs. 11-13. More specifically, discussions with respect to FIGs. 11-13 would substantially parallel the discussions with respect to FIGs. 9 and 10 and, accordingly, redundancy is omitted for the sake of brevity. The differences between FIGs. 11-13 versus FIGs. 9 and 10 are that the thinner coating 550N of FIG. 5B is illustrated/used together with an additional adhesive layer 1250 (FIG. 12 view 1200) for use in the flip chip assembly process. The adhesive layer 1250 can be made of any suitable material, e.g., may be made of the same material as the coating 550, 550', such as a thermoplastic or thermoset polymer. As advantages, the adhesive coating 1250 is used to compensate for the fact that the planarized/pre-backfill coating 550N does not completely cover the bumps 130, and additional under-fill material is needed to fill in areas between the flip chip lands 970 and/or the remaining height of the bumps 130. The adhesive coating 1250 thus effectively serves as a secondary under-fill layer. The final result is the alternative very thin die flip chip assembly 1300, as illustrated in FIG. 13.

IN THE CLAIMS:

Please amend the claims as follows. Note that the full text and/or status of all claims (including those not being amended within this paper) may also be included to provide the convenience of a complete set of claims for easy review:

1. (Canceled without prejudice or disclaimer)

2. (Canceled without prejudice or disclaimer)

3. (Amended) A planarizing support layer provided on a bumped surface of one of a bumped-die and bumped-wafer, the support layer comprising a pre-back-grind under-fill layer both to provide substantially planar back-grind wafer support during any back-grind process, and to provide under-fill material during any mounting/under-fill process, the under-fill layer covering at least a substantial majority of bump-bodies of bumps on the bumped surface, while leaving a remainder portion of the bump-bodies exposed; and ~~A support layer as claimed in claim 2, the support layer further comprising~~

an adhesive protection tape including a flexible conforming layer applied to the under-fill layer, the conforming layer to cover the remainder portion of the bump-bodies not covered by the under-fill layer, to further improve a planarity of the support layer.

4. (Amended) A planarizing support layer provided on a bumped surface of one of a bumped-die and bumped-wafer, the support layer comprising a pre-back-

grind under-fill layer both to provide substantially planar back-grind wafer support during any back-grind process, and to provide under-fill material during any mounting/under-fill process. A support layer as claimed in claim 1, the under-fill layer covering an entirety of bump-bodies of bumps on the bumped surface.

5. (Original) A support layer as claimed in claim 4, the support layer further comprising an adhesive protection tape applied to the under-fill layer.

6. (Original) A support layer as claimed in claim 4, the under-fill layer being of a predetermined thickness beyond a height thickness of the bump-bodies, to provide additional under-fill material to under-fill structures other than the bumps during any mounting/under-fill process.

7. (Amended) A support layer as claimed in claim 4 4, the under-fill layer comprising a polymer material.

8. (Amended) A support layer as claimed in claim 4 4, the under-fill layer comprising one of a thermoplastic and thermoset polymer material.

9. (Amended) A support layer as claimed in claim 4 4, the under-fill layer comprising one of a thermoplastic material, thermoset material, light-curable material and a chemical-curable material.

10. (Amended) A support layer as claimed in claim 4 4, the under-fill layer comprising an opaque material to provide at least one of light, ultra-violet (UV) light, and radiation protection to a surface of the bumped-die or bumped-wafer.

11. (Canceled without prejudice or disclaimer)

12. (Canceled without prejudice or disclaimer)

13. (Amended) A back-grind/mounting arrangement comprising one of a bumped-die and bumped wafer comprising: a planarizing support layer provided on a bumped surface of the bumped-die or bumped-wafer, the support layer comprising a pre-back-grind under-fill layer both to provide substantially planar back-grind wafer support during any back-grind process, and to provide under-fill material during any mounting/under-fill process, the under-fill layer covering at least a substantial majority of bump-bodies of bumps on the bumped surface, while leaving a remainder portion of the bump-bodies exposed; and ~~An arrangement as claimed in claim 12, the support layer further comprising~~

an adhesive protection tape including a flexible conforming layer applied to the under-fill layer, the conforming layer to cover the remainder portion of the bump-bodies not covered by the under-fill layer, to further improve a planarity of the support layer.

14. (Amended) An arrangement as claimed in claim 42 13, the arrangement further comprising a secondary under-fill layer to under-fill at least one of: the

reminder portion of the bump-bodies not covered by the under-fill layer, and structures other than the bumps as encountered during any mounting process.

15. (Amended) A back-grind/mounting arrangement comprising one of a bumped-die and bumped wafer comprising: a planarizing support layer provided on a bumped surface of the bumped-die or bumped-wafer, the support layer comprising a pre-back-grind under-fill layer both to provide substantially planar back-grind wafer support during any back-grind process, and to provide under-fill material during any mounting/under-fill process. ~~An arrangement as claimed in claim 14,~~ the under-fill layer covering an entirety of bump-bodies of bumps on the bumped surface.

16. (Original) An arrangement as claimed in claim 15, the support layer further comprising an adhesive protection tape applied to the under-fill layer.

17. (Original) An arrangement as claimed in claim 15, the under-fill layer being of a predetermined thickness beyond a height thickness of the bump-bodies, to provide additional under-fill material to under-fill structures other than the bumps as encountered during any mounting process.

18. (Amended) An arrangement as claimed in claim 14 15, the under-fill layer comprising a polymer material.

19. (Amended) An arrangement as claimed in claim 44 15, the under-fill layer comprising one of a thermoplastic and thermoset polymer material.

20. (Amended) An arrangement as claimed in claim 44 15, the under-fill layer comprising one of a thermoplastic material, thermoset material, light-curable material and a chemical-curable material.

21. (Amended) An arrangement as claimed in claim 44 15, the under-fill layer comprising an opaque material to provide at least one of light, ultra-violet (UV) light, and radiation protection to a surface of the bumped-die or bumped-wafer.

22. (Amended) An arrangement as claimed in claim 44 15, wherein the arrangement is a flip-chip back-grind/mounting arrangement.

23. (Canceled without prejudice or disclaimer)

24. (Canceled without prejudice or disclaimer)

25. (Amended) A back-grind/mounting method useable with either one of a bumped-die and bumped wafer, the method comprising: providing a planarizing support layer on a bumped surface of the bumped-die or bumped-wafer, the support layer comprising a pre-back-grind under-fill layer both to provide substantially planar back-grind wafer support during any back-grind process, and to provide under-fill

material during any mounting/under-fill process, the under-fill layer covering at least a substantial majority of bump-bodies of bumps on the bumped surface, while leaving a remainder portion of the bump-bodies exposed; and A method as claimed in claim 24,
the support layer further comprising

an adhesive protection tape including a flexible conforming layer applied to the under-fill layer, the conforming layer to cover the reminder portion of the bump-bodies not covered by the under-fill layer, to further improve a planarity of the support layer.

26. (Amended) A method as claimed in claim 24 25, the method further comprising: providing a secondary under-fill layer to under-fill at least one of: the reminder portion of the bump-bodies not covered by the under-fill layer, and structures other than the bumps as encountered during any mounting process.

27. (Original) A back-grind/mounting method useable with either one of a bumped-die and bumped wafer, the method comprising: providing a planarizing support layer on a bumped surface of the bumped-die or bumped-wafer, the support layer comprising a pre-back-grind under-fill layer both to provide substantially planar back-grind wafer support during any back-grind process, and to provide under-fill material during any mounting/under-fill process, A method as claimed in claim 23, the under-fill layer covering an entirety of bump-bodies of bumps on the bumped surface.

28. (Original) A method as claimed in claim 27, the support layer further comprising an adhesive protection tape applied to the under-fill layer.

29. (Original) A method as claimed in claim 27, the under-fill layer being of a predetermined thickness beyond a height thickness of the bump-bodies, to provide additional under-fill material to under-fill structures other than the bumps as encountered during any mounting process.

30. (Amended) A method as claimed in claim ~~23~~ 27, the under-fill layer comprising a polymer material.

31. (Amended) A method as claimed in claim ~~23~~ 27, the under-fill layer comprising one of a thermoplastic and thermoset polymer material.

32. (Amended) A method as claimed in claim ~~23~~ 27, the under-fill layer comprising one of a thermoplastic material, thermoset material, light-curable material and a chemical-curable material.

33. (Amended) A method as claimed in claim ~~23~~ 27, the under-fill layer comprising an opaque material to provide at least one of light, ultra-violet (UV) light, and radiation protection to a surface of the bumped-die or bumped-wafer.

34. (Amended) A method as claimed in claim ~~23~~ 27, wherein the method is a flip-chip back-grind/mounting method.